

REMARKS

In connection with Applicants' Request for Continued Examination (RCE), Applicants respectfully request entry of the foregoing and reexamination and reconsideration of the subject matter identified in caption, as amended, pursuant to and consistent with 37 C.F.R. §1.114, and in light of the remarks which follow.

Claims 1-3 and 5-44 are now in this application.

Claims 1-34 were previously presented. Claim 4 was previously cancelled. Claims 43 and 44 are newly added.

Claims 1 and 8 have been amended to recite that the process is performed without the use of a phosphine. Support for this amendment is found in the specification at least on page 2, paragraph [0013] and page 31, paragraph [0122]. Claim 5 has been amended to correct a typographical error by replacing a period with a semi-colon and to add the word "and" to make the claim grammatically correct. Claim 9 has been amended to delete the structure of formula (I') that was added in the previous amendment. Claim 11 has been amended to correct a typographical error by deleting a space between the word atom and a comma. Claim 15 has been amended to delete the phrase "which preferably has at least 4 atoms in the ring" Claim 19 has been amended to replace "saturated" with "unsaturated." and to delete the phrase "preferably sodium," Support for this is found in the specification on page 27, lines 4-8 and lines 28-32. Claim 36 has been amended to delete the double recitation of dioxane and anisole being claimed solvents and to only recite them being a claimed solvent once.

Claims 43 and 44 have been added. Claim 43 recites a definition of D that was previous present in Claim 15 as a preferred element. Claim 44 recites a definition of Z in R5 that was previous present in Claim 19 as a preferred element.

No new matter has been added in these amendments.

Applicants gratefully acknowledge with withdrawal of: (1) the objections to claims 6, 7 and 11-34, (2) the rejection of claims 4, 5, 9 and 10 under 35 U.S.C., second paragraph; and (3) the rejections of claims 1-5 and 8-10 under 35 U.S.C. 102(b) as being anticipated by Denmark et al.

Specification

The Office Action indicates that the specification fails to provide proper antecedent basis for "it being possible for Y³ or Y⁴ to form, with R⁴ or R^{4'} and with the atoms to which they are connected, an unsaturated or completely or partially saturated 5- or 6-membered ring" in Claim 19.

Claim 19 has been amended to recite " it being possible for Y³ or Y⁴ to form, with R⁴ or R^{4'} and with the atoms to which they are connected, an unsaturated or completely or partially unsaturated 5- or 6-membered ring". Support for this is found in the specification on page 27, lines 4-8 and lines 28-32.

Applicants therefore request the withdrawal of this rejection.

Claim Objections

Claims 5 and 36 have been objected to for having a period after "atoms" in claim 5 and for having the solvents dioxane and anisole listed twice in claim 36.

Claims 5 and 36 have been amended to correct these items. Applicants therefore request the withdrawal of this objection.

35 U.S.C. §112 first paragraph Rejections

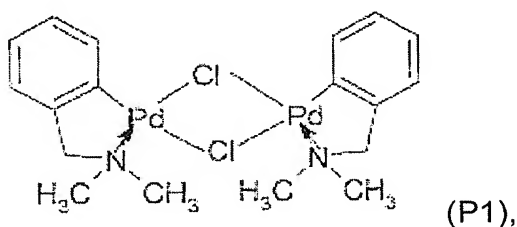
Claims 9, 10, 21 and 22 have been rejected under 35 U.S.C. §112, first paragraph, as failing to comply with the written description requirement. The Office Action indicated the specification does not provide support for the added formula in claim 9 nor for R⁵ being hydrogen as disclosed in claim 21.

Claim 9 has been amended to delete the structure added in the last amendment. Applicants therefore request the withdrawal of the rejections of claims 9 and 10.

Support for R⁵ being hydrogen in claim 21 is found in the specification in paragraph [0117] on page 30 which states:

Preference is additionally given, among the compounds of formula (IV-1) above, to those for which R⁵ is hydrogen or a halogen atom, for example fluorine or chlorine. (emphasis added)

Additional support is also found in paragraph [0118] which shows palladacycle of formula P1:



where R⁵ is hydrogen.

Applicants therefore respectfully submit there is support in the specification for R⁵ being hydrogen. Applicants therefore request the withdrawal of the rejection of Claims 21 and 22.

35 U.S.C. §112 second paragraph Indefiniteness Rejection

Claims 15-17 and 19-22 have been rejected under 35 U.S.C. §112, second paragraph, as purportedly being indefinite for failing to particularly point out and distinctly claim the subject matter which that applicant regards as the invention.

Claim 15 has been rejected for reciting a broad recitation where D is the residue of a cyclic compound and also reciting which preferably has at least 4 atoms in the ring. Claim 15 has been amended to delete the phrase "which preferably has at least 4 atoms in the ring." Therefore Claim 15, and Claims 16 and 17 which depend from claim 15, particularly point out and distinctly claim the subject matter which Applicant regards as the invention. Applicants therefore request the withdrawal of the rejection of Claims 15-17.

Claim 19 has been rejected for reciting a broad recitation where Z is an alkali metal and also reciting preferably sodium. Claim 19 has been amended to delete the phrase "preferably sodium." Therefore Claim 19, and Claims 20-22 which depend from claim 19, particularly point out and distinctly claim the subject matter which Applicant regards as the invention. Applicants therefore request the withdrawal of the rejection of Claims 19-22.

35 U.S.C. §103(a) Obviousness Rejection

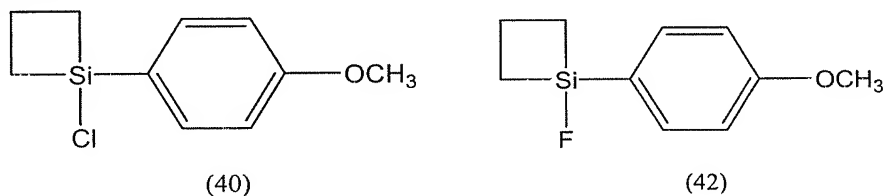
Claims 1-3 and 5-42 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Denmark et al. (US 2002/0183516) in view of Dupont et al. (Eur. J. Inorg. Chem., Vol. 2001, Issue 8, August 2001, pages 1917-1927).

Applicants respectfully submit that the claims are not obvious over Denmark et al. in view of Dupont et al. and that all of the claims are allowable.

To establish a *prima facie* case of obviousness, three basic criteria must be met. (MPEP 2143) First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Secondly, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations.

Denmark et al. teach cross-coupling reactions of organosilicon nucleophiles and the importance of the presence of phosphines in reducing or minimizing undesired homocoupling by-products. Denmark et al. teach:

[0084] Initial studies of the cross-coupling reaction of methyl-(phenyl)silacyclobutane with either aryl or alkenyl iodides gave no desired products under various conditions, including those optimized for alkenylsilacyclobutanes. The reactivity of the arylsilacyclobutanes was enhanced by introducing a heteroatom on the silicon. Chlorosilane 40 and fluorosilane 42 were prepared in a straightforward fashion from dichlorosilacyclobutane (38) (available from Aldrich or Gelest Inc.), Scheme 4.



(Structure added for ease of review)

[0085] Orienting experiments with 42 and iodobenzene revealed that under standard coupling conditions (TBAAF/Pd(dba)₂/THF/RT, see

18) 25% conversion could be obtained in 48 hours. Screening different Pd sources identified $[\text{allylPdCl}]_2$ as the superior catalyst in terms of rate and amount of side reaction. With this catalyst, fluorosilane 42 was found to be more reactive than chlorosilane 40 and thus was used to optimize the other reaction variables.

[0086] Careful investigation of the reaction between 42 and iodobenzene showed that homocoupling of both these substrates (to generate 45 or 46, for example) was a serious liability (entry 1, Table 3) (11,19). Where no ligand was added both possible homocoupling products 45 and 46 were observed. To facilitate the transmetallation and eliminate the cross-coupling, various additives were surveyed with ratio of ligand/palladium of 2.0. The additives examined (Table 3) cover a wide range of donor properties and steric bulk. While (o-tol).sub.₃P (entry 2), $(\text{C}_6\text{F}_5)_3\text{P}$ (entry 3), and phosphite 48 (entry 9) suppressed the desired coupling, the other ligands such as tri(2-furyl)-phosphine (entry 4) and triphenylarsine (entry 5) and the bulky ligands such as tri(tert-butyl)phosphine (entry 6) (20) and tricyclohexylphosphine (entry 7) were effective in eliminating the homocoupling of arylsilanes and significantly suppressing the homocoupling of aryl iodides. Nevertheless, the desired cross-coupling was still rather sluggish. It was surprising that recently introduced ligand 47 (entry 8) did not inhibit the generation of 45 (21).

Table 3 of Denmark et al. shows that high levels of three products, including undesired homocoupling by-products, are formed when phosphine ligands are not used in the reaction. (entry 1) Even when phosphine ligands are used, significant amounts of one bi-product is formed in amounts from 5 - 25%. Table 7 of Denmark et al. shows that when 20 mol % of $(\text{t-Bu})_3\text{P}$ is used, reaction yields ranged from 71-92%. Denmark et al. also teach that the use of lower amounts of phosphine reduce the yield of the desired product and increase the yield of the undesired product. While Denmark et al. evaluated a wide number of parameters, including the nature of various phosphines and the amount of phosphine used, Denmark et al. is silent of the use of a dihalosilane.

Denmark et al. therefore teach that: (1) performing the reaction without a phosphine results in the formation of a mixture of three products; (2) performing the reaction with a phosphine at a level of 20 mole % eliminates one of the reaction by-products; and (3) overall reaction yields, when using a phosphine at a level of 20 mole %, range from approximately 70-90%. Denmark et al. is silent on the use of a dihalosilane.

There is nothing in Denmark et al. that teaches or suggests that the claimed process, which uses a dihalosilane in place of a monohalosilane, would result in a process that reduces undesired homocoupling by-products without the use of a phosphine and that higher yields of the desired product are obtained. One of ordinary skill in the art, upon reading Denmark et al. would not have reasonably expected that the claimed process would be successful when Denmark et al. teach that the presence of a phosphine is required. Such a person would also not expect that the use of a dihalosilane, rather than a halosilane, would result in not needing to use a phosphine and having improved yields.

Dupont et al. teach that palladacycles can be used as catalysts in a variety of known reactions.

To establish a *prima facie* case of obviousness, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. There is no suggestion or motivation in Denmark et al. or Dupont et al. to modify the Denmark et al. to obtain the process of the present invention. In fact one of ordinary skill in the art, upon reading Denmark et al., would

not be motivated to modify the reference to obtain process because Denmark et al. teach the necessity of using a phosphine, which is not present in the claimed invention. Denmark et al. teach that in the absence of phosphines such reactions for significant amounts of undesired homocoupling by-products and that the desired product is formed in low yields. Denmark et al. teach the need for use of about 20 mole % of a phosphine, and that even under such conditions, yields would only be expected to range from about 70-90%. There is no suggestion or motivation in the cited prior art to use a dihalosilane rather than a monohalosilane to result in a process that does not require the presence of a phosphine and has increased yields. Therefore there is no suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the references or to combine reference teachings to obtain the applicants' invention.

To establish a *prima facie* case of obviousness, there must be a reasonable expectation of success. There would not be a reasonable expectation of success in obtaining the applicants' invention because Denmark et al. does not teach or suggest a process that does not use a phosphine, as required by the claims of the instant application or using a dihalosilane in place of a monohalosilane. As indicated above, Denmark et al. teach that performing the reaction with a monohalosilane without a phosphine results in the formation of a mixture of three products, with low yields, about 70%, of the desired product. Denmark et al. teaches that it is necessary to use a phosphine at a level of 20 mole % to eliminate the formation of one of the reaction by-products. Denmark et al. also teaches that the overall reaction yields of the desired product, using a phosphine at a level of 20 mole %, range from approximately 70-90%. The Office Action states:

Denmark et al. utilize an analogous process and the skilled artisan would reasonably expect that the use of similar transferable groups would obtain similar results. (page 6, lines 4-6)

Applicants have shown above that their method, which uses a dihalosilane rather than a monohalosilane, does not obtain similar results. Denmark et al. demonstrated that performing the reaction using a monohalosilane without a phosphine resulted in the formation of a mixture of three products, with low yields, about 70%, of the desired product. As indicated by the Office Action, one of ordinary skill in the art would have expected similar results, i.e. a mixture of three products, including non-desirable homocoupling by-products and reaction yields of about 70%. However this is not what is obtained from using the Applicants process. One of ordinary skill in the art would not have expected that by using a dihalosilane in place of a monohalosilane one would have obtained the Applicants method. There is nothing in the cited prior art that would lead one to have a reasonable expectation of success in obtaining the Applicant's when Denmark et al. show that a phosphine is required to be present in their method to produce their results. There cannot be a reasonable expectation of success in obtaining a process having certain results, when the process being modified teaches that the removed element must to present to have obtained their reported results. Therefore there would not have been a reasonable expectation of success in combining the references to obtain the applicants' invention.

To establish a *prima facie* case of obviousness, the prior art reference must teach or suggest all the claim limitations. The prior art references do not teach or suggest the use of a dihalosilane and that performing the reaction without the use of a phosphine. As shown above, Denmark et al. teach that the use of a

monohalosilane requires the use of a phosphine in order to minimize cross-coupling reactions and to have yields in the range of about 70-90%. Although Denmark et al. extensively evaluated a variety of phosphines and various reaction conditions, including that amounts of phosphine used in the reaction, the silence of Denmark et al. regarding any variation in the halosilane shows that Denmark et al. did not teach or suggest these claim limitations. . Therefore the cited prior art references do not teach or suggest all the claim limitations.

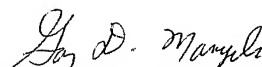
Applicants respectfully submit that the claims are not obvious over Denmark et al. in view of Dupont et al. Applicants therefore request the withdrawal of the rejections of the claims under 35 U.S.C. §103(a).

In view of the foregoing, it is believed that entry of the proposed amendments should be allowed and that the record rejections cannot be maintained against the proposed claims once entered into this application. Further, favorable action in the form of a Notice of Allowance is believed to be next in order and is earnestly solicited.

Respectfully submitted,

BUCHANAN INGERSOLL & ROONEY PC

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